JAIN WELL CASING & SCREEN PIPES

Jain Pipes®

Your Lifeline to Prosperity®

PVC-U Well Casing and Screen Pipes for Water Well Construction

Introduction

Water covers almost three quarters of the earth's surface and a major portion of this is found in the oceans or frozen in the Polar Regions. Only a small percentage of fresh water is available as surface water in lakes, rivers, streams and as ground water. Ground water is the finite source and it must be exploited very carefully.

The past fifty years witnessed a global expansion of the water well industry particularly as extraction of water from the wells has become the lifeline of industry, agriculture, and drinking water supply in cities, towns and villages.

Well construction products, therefore, play an important role to ensure the highest quality, efficiency and productivity of the well. In the past, metal casing and screens were the natural choice of well design engineers and drillers. However this material was not always found to be suitable, particularly in conditions where rapid corrosion of casing pipes, deterioration of screens or formation of bacteria resulted in abandonment of the well or worse still to contaminate the source.

Synthetic materials that belong to a family of Thermoplastics have proven to be the most superior materials for well construction. Among others, unplasticised Polyvinyl Chloride (u-PVC) that is ideally suited for use in well construction also belongs to this family of thermoplastics.

PVC-U has higher density than water that provides a clear advantage in well construction. Its yield stress of 55N/mm² is comparatively high. The modulus of elasticity is also high enough to achieve excellent stiffness in pipes preventing undesired deformation of the pipe.

The other mechanical and thermal properties of PVC-U are so favorable that they comply with the specific requirements of well construction. Well pipes in use are continuously affected by the water and soil corrosion. It is therefore important to use the materials that are insensitive and resistant to corrosion.

PVC-U is resistant to all substances dissolved in natural ground waters. PVC-U is also resistant to aggressive and highly concentrated acids and salts. Its resistance covers a pH range of water between 2 & 12, due to which the chemicals used, for cleaning, developing and regenerating the wells (both organic and inorganic) do not affect the PVC-U well pipes. PVC-U is completely resistant to bacteria in water and soil.

The various physical and chemical properties of PVC-U material make it an ideal choice for well construction. Mechanical properties could be achieved by designing the right dimensional requirements of the pipes. Well pipe made with PVC-U can be adapted to the respective conditions by choosing the corresponding wall thickness of the pipes.

Tensile Strength

The tensile strength required can be calculated on the basis of the pipe weight. In addition to the pipe weight, gravel that gets stuck on the joints during the assembly and settlement phase should be considered in design calculations. The lower load bearing capacity of screen pipes with slots should also be considered when the screen pipes are installed at multiple locations in a deep well. General recommendations on the admissible laying depth of the pipes therefore are not possible. It is imperative to assess the respective loads for each individual project.

Resistance to External Pressure

In order to determine the admissible laying depth of the well pipes, it is necessary to establish the load bearing capacity of the joints and the resistance to the external pressures. In practice, possible external pressures depend on several factors and some of those pressures cannot be quantified. Major external pressures are observed while laying the well pipes, gravel packing, sealing the annular spaces, developing the well or when pumping (due to larger differences in water level). The effect of such pressures cannot be precisely determined.

When sinking pipes through clay layers, additional compressive forces are exerted due to swelling clays. This can happen at any depth and in extreme cases may cause considerable strain on the material surface. The values indicated in the tables of this brochure are based on the minimum wall thickness of the pipes, there diameters and material composition.

Impact of Temperature

Temperature conditions prevailing during the laying of PVC-U well pipes will influence the mechanical properties of the material. High temperature between 30°C and 40°C as indicated by the creep strength in relation to time, the PVC-U material properties provide sufficient safety factor for the intended use. It is however important to determine the other influences while encasing the well pipes with concrete to seal the drill holes. Temperature increases can be caused by the hydration heat of concrete. Calculations however show that these temperatures do not normally exceed 15°C, with the temperature of unset concrete reaching approx. 18°C, the temperature within the seal will be slightly more than 30°C and that is within the optimum limits.

Material

PVC-U, unplasticised polyvinyl chloride is the most ideal material for manufacturing well pipes as it is impervious to corrosion and chemical action, easy to handle and install, light in weight, non toxic, non conductive. Its long service life makes it an economical choice over other materials. Selection of right polymer grades, additives and stabilizing agents is an important criteria to produce a quality product and the Jains lay a special emphasis on this. The pipes produced by Jain are free from Lead and Tin based PVC-U compound.

Properties

Physical Properties

To meet or exceed the user's expectations on the external pressure resistance, load bearing capacity of the threads, pipe dimensions and free open area of the screen pipe Jain follows all the set standards for the criteria. Tests on the physical properties and their compliance with the applicable rules and guidelines are carried out at State of the art in-house Laboratory. Technical data of the physical properties of our well pipes are listed in the table below:

Chemical Properties

The chemical resistance of PVC-U well pipes is exceptionally high. Those pipes are highly resistant to all kinds of groundwater, lake water, brine and even diluted acids and alkaline solutions.

Even the repeated treatment with regenerating and disinfecting agents do not affect our well pipes.

Standard	DIN - 4925			IS - 12818		
Properties	**Unit**	**Value**	**Standard**	**Unit**	**Value**	**Standard**
Impact strength	-	max.10%rupture	DIN EN ISO179	%TIR	MAX-10	IS12235 Part 9
Notched impact strength	Kj/m^2	above 5	DIN EN ISO179	-	-	-
Yield stress	N/mm^2	45 to 55	DIN EN ISO 527-2	MPA	Min-45	IS12235 Part 13
Modulus of elasticity	N/mm^2	2500 to 3000	DIN EN ISO 178	-	-	-
VST	-	-	-	°C	Min-79	IS12235 Part 2

Standard :

Since 1981, Plastic Well Casing and Screen pipes manufacturing guidelines have been laid in DIN 4925, Part 1-3 & in IS 12818 since 1989 Standard. This standard defines the following properties:

- Material
- Pipe Colour
- Pipe nominal diameter, outside diameter and wall thickness.
- Laying length
- Slot cutting lateral to the tubular axis including slot specifications like slot width, slot length, number of slots, Summation of slot, % open area, etc.
- Thread Joints

Summarizing, we can say that the standard on plastic screen and well casing pipes manufactured from unplasticised polyvinyl chloride (PVC-U) comprises the following:

IS 12818:

Well screens and casing of unplasticised polyvinyl chloride (PVC-U) for Water Well Filter Pipes & Casing DN 40 to DN 400

DIN 4925, Part 1

Well screens and casing of unplasticised polyvinyl chloride (PVC-U) for Water Well Filter Pipes & Casing - Part1 : DN 35 to DN 100 with Whitworth pipe thread according to DIN 2999-1

DIN 4925, Part 2

Well screens and casing of unplasticised polyvinyl chloride (PVC-U) for Water Well Filter Pipes & Casing - Part2: DN 100 to 200 with Trapezoidal thread.

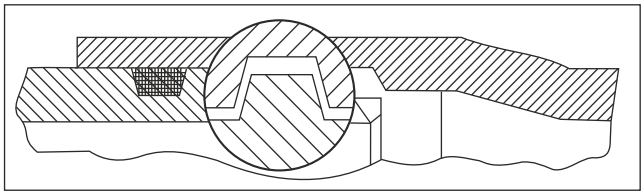
DIN 4925, Part 3

Well screens and casing of unplasticised polyvinyl chloride (PVC-U) for Water Well Filter Pipes & Casing tube wells-Part3: DN 250 to DN 400 with Trapezoidal thread.

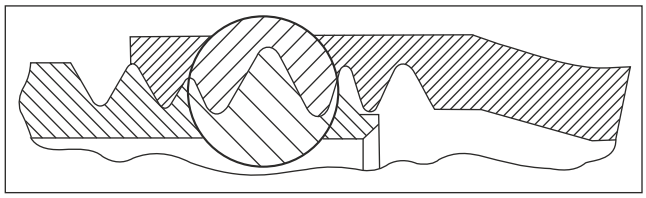
Thread Joints

R ≙ Pipe thread, DIN 4925/ IS 12818

T ≙ Trapezoidal thread, DIN 4925/ IS 12818



T ≙ Trapezoidal thread according to IS 12818 & DIN 4925 Part 2 and 3, pitch 12mm, DN 250-400



R ≙ Pipe thread (Whitworth pipe thread) according to DIN 4925 Part 1, with reference to DIN 2999 Part 1, cylindrical internal thread and taper external thread, pitch 11 threads per inch, DN 35-100 and IS 554:1985 for DN 40 to DN 80

Screen Permeability

The possible production capacity of a well basically depends on the following factors:

- Permeability and yield of the water bearing strata
- Permeability of the filtering gravel
- Permeability of the well screen
- Entrance velocity of the water at the screen

Screen dimensions are determined assuming good yield of the aquifer and an average entrance velocity of water at 3cms/sec.

This value prevents tendency towards incrustation and thus possible reduction in the service life of the water well. This also avoids the possible risk of carrying sand from the formation as designing within this velocity avoids trbulence in the entrance to the screen. (Please refer to the relevant technical literature as well)

Under realist conditions, free pore area of gravel heap in its densest packing amounts to approx. 4.5% due to the grading mix containing non circular gravel grains. Aquifer worthy of development show permeability (kF values) of 10^{-7} to 10^{-3} m/sec. Upon entry into the annular spaces filled with filter gravel these values changes between 10^{-4} to 10^{-2} m / sec.

This means that in situ grain size distribution of the aquifer represents the major hindrance that leads to largest flow losses. When the water has reached the annular spaces it can enter the screen pipe almost without any hindrance.

Free Open Area

The percentage free open area is the sum of all internal slotted area of the screen pipe in relation to the total internal surface area of the slotted length of pipe. The plastic screens are manufactured with slots across the pipe axis. This ensures better stability against lateral rock or soil pressure that is especially important in deep wells.

Screen Open Area Dia. 50 mm - 400 mm

Nominal Diameter		Number of slots	Σa±5%	Slot Width in mm							
				0.2	0.3	0.5	0.75	1	1.5	2	3
mm	inch	Diameter	mm	Percentage of Open Area							
50	2	3	108	3.7	5.2	6.0	9.1	9.4	9.7	12.1	—
80	3	3	168	3.7	5.2	6.0	9.1	9.4	9.7	12.1	—
100	4	5	216	3.7	5.2	6.0	9.1	9.4	9.7	12.1	14.0
115	4½	5	240	3.7	5.2	6.0	9.1	9.4	9.7	12.1	14.0
125	5	5	240	—	4.7	5.6	8.2	8.5	8.8	11.0	13.5
150	6	5	285	—	—	5.6	8.2	8.5	8.8	11.0	13.5
175	7	6	340	—	—	5.6	8.3	8.5	8.8	11.0	13.5
200	8	6	390	—	—	—	8.3	8.5	8.8	11.0	13.5
250	10	6	450	—	—	—	7.6	7.9	8.1	10.2	12.5
300	12	6	530	—	—	—	7.6	7.9	8.1	10.2	12.5
350	14	8	640	—	—	—	—	7.9	8.1	10.2	12.5
400	16	8	720	—	—	—	—	7.9	8.1	10.2	12.5
Slot pitch mm				4.0	4.0	5.5	5.5	6.8	9.5	9.5	11.0

* Summation of slots given is for medium thickness screens. For heavy thickness screens, the summation of slots will be marginally less. The percentage of open area remains the same for both thicknesses.

Screen Permeability Dia. 50mm - 400mm

Nominal Diameter		Slot Width in mm							
		0.2	0.3	0.5	0.75	1	1.5	2	3
mm	inch	Permeability per Meter of Screen in LPS at V = 3 cm /sec.							
50	2	0.18	0.25	0.29	0.44	0.45	0.46	0.58	0.67
80	3	0.27	0.39	0.45	0.68	0.70	0.72	0.90	1.04
100	4	0.35	0.50	0.57	0.87	0.90	0.93	1.16	1.34
115	4½	0.40	0.56	0.64	0.97	1.01	1.04	1.30	1.50
125	5	—	0.56	0.66	0.97	1.00	1.04	1.30	1.59
150	6	—	—	0.78	1.15	1.19	1.23	1.54	1.89
175	7	—	—	0.93	1.38	1.41	1.46	1.82	2.24
200	8	—	—	—	1.59	1.62	1.68	2.10	2.58
250	10	—	—	—	1.81	1.88	1.93	2.42	2.97
300	12	—	—	—	2.13	2.22	2.27	2.86	3.51
350	14	—	—	—	—	2.69	2.76	3.47	4.26
400	16	—	—	—	—	3.03	3.11	3.91	4.79

Jain PVC-U Well Casing & Screen Pipes
DIN 4925/ IS 12818 - Threaded Joints

Nominal Diameter		Outside Dia.	Wall Thickness	Inside Dia.	Outside Diameter Over Connection	Resistance to Hydraulic Collapse Pressure (RHCP)	Max. Tensile Strength Threaded Connection	
		min.	min.	min.	max.			
mm	Inch	mm	mm	mm	mm	Kg/cm^2	kg	
35	1¼	42	3.5	33.8	46	32	492	Pipe Thread acc.to DIN 2999/IS12818
40	1½	48	3.5	39.8	53	32	554	
50	2	60	4.0	50.8	66	24	856	
80	3	88	4.0	78.8	94	7.5	1351	
100	4*	113	5.0	101.6	121	7.5	2024	Trapezoidal Thread acc. to DIN 4925/ IS12818
			7.0	97.2	125	15.5	3458	
115	4½	125	5.0	113.6	132	7.5	2253	
			7.5	108.0	137	15.5	4247	
125	5	140	6.5	125.2	149	7.5	3192	
			8.0	122.0	152	15.5	4528	
150	6	165	5.7	152.0	173	3.0	3153	
			7.5	148.0	176	7.5	4873	
			9.5	143.6	180	15.5	6972	
175	7	195	8.5	175.6	205	7.5	7022	
			11.5	168.4	211	15.5	10745	
		200	7.0	184.4	212	3.0	5580	
			8.8	180.4	215	7.5	7925	
200	8	225	7.6	207.4	238	3.0	7206	
			10.0	202.6	241	7.5	10364	
			13.0	195.4	247	15.5	14659	
250	10	280	9.6	258.0	292	3.0	7680	
			12.5	252.0	297	7.5	12518	
			16.0	244.8	304	15.5	18755	
300	12	330	11.2	303.4	346	3.0	11502	
			14.5	297.6	350	7.5	17964	
			19.0	288.0	359	15.5	27418	
350	14	400	14.0	369.0	420	3.0	21497	
			17.5	361.0	425	7.5	29713	
			21.5	352.2	433	12.0	39944	
400	16	450	16.0	415.0	470	3.0	24099	
			19.5	406.6	475	7.5	33195	
			23.5	397.8	490	11.3	45870	

Available in straight length: 1.0, 2.0 and 3.0 meter.
* 4 inch Casing also available with Pipe Thread according to DIN 4925 & IS 12818

Slot Size	DN 35-115	0.2, 0.3, 0.5, 0.75, 1.0, 1.5, 2.0 mm
	DN 125	0.3, 0.5, 0.75, 1.0, 1.5, 2.0, 3.0 mm
	DN 150 - 175	0.5, 0.75, 1.0, 1.5, 2.0, 3.0 mm
	DN 200 - 300	0.75, 1.0, 1.5, 2.0, 3.0 mm
	DN 350 - 400	1.0, 1.5, 2.0, 3.0 mm

JAIN PVC - U Screen & Casing Pipes
Jain SURE-LOC® Joints

Nominal Diameter		Outside Dia.	Wall Thickness	Inside Dia.	Socket Outside Dia.	Resistance to Hydraulic Collapse Pressure (RHCP)	Max. Tensile Strength Sure-Loc Connection
mm	inch	mm	mm	mm	mm	Kg/cm^2	kg
50	2	60.0	5.5	47.6	73	66	929
80	3	88.7	6.0	75.1	103	25	1400
100	4	113.0	6.0	99.4	127	11.5	1830
115	4 ½	125.0	6.0	111.4	139	8.5	2042
125	5	140.0	6.5	125.2	155	7.5	2758
150	6	165.0	7.5	148.0	183	7.5	3369
175	7	195.0	8.5	175.6	215	7.5	5020
200	8	225.0	10.0	202.6	248	7.5	5790
250	10	280.0	12.5	252.0	309	7.5	10800
300	12	330.0	14.5	297.6	363	7.5	12729
350	14	400.0	17.5	361.0	440	7.5	15428
400	16	450.0	19.5	406.6	495	7.5	17357

Available in straight length: 1.0, 2.0, 3.0, 4.0 & 6.0 meter.
Resistance to Hydraulic Collapse Pressure (RHCP) given in the table are valid only for plain casing pipe with sure-loc joint.

Slot Size:	DN 50 - 115	0.3, 0.5, 0.75, 1.0, 1.5, 2.0 mm
	DN 125	0.3, 0.5, 0.75, 1.0, 1.5, 2.0, 3.0 mm
	DN 150 - 175	0.5, 0.75, 1.0, 1.5, 2.0, 3.0 mm
	DN 200 - 300	0.75, 1.0, 1.5, 2.0, 3.0 mm
	DN 350 - 400	1.0, 1.5, 2.0, 3.0 mm

How to assemble JAIN SURE-LOC®

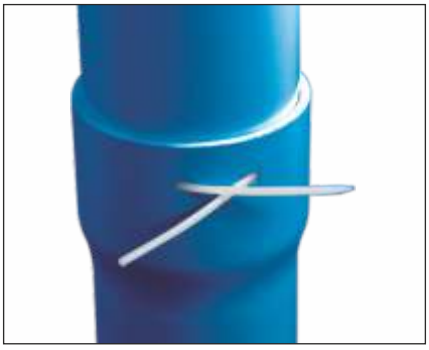
Clean

Place O-ring seal and lubricate with a water-soap mixture

Push the spigot into the socket

Insert the spline

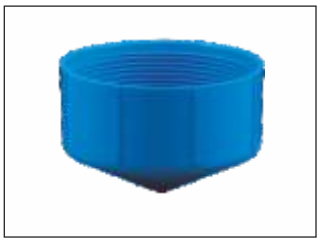
The front end must be visible



Ready

Jain PVC-U Screen & Casing Pipes Accessories

The following accessories, adaptors and Transition fittings in various sizes and types of joints are available to complete well installation



End Cap

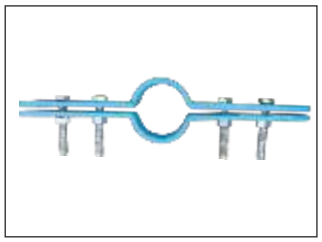
Reducer

Centering Guide

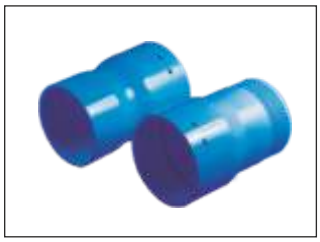
Top Cap

Lifting Cap

Wooden Clamp

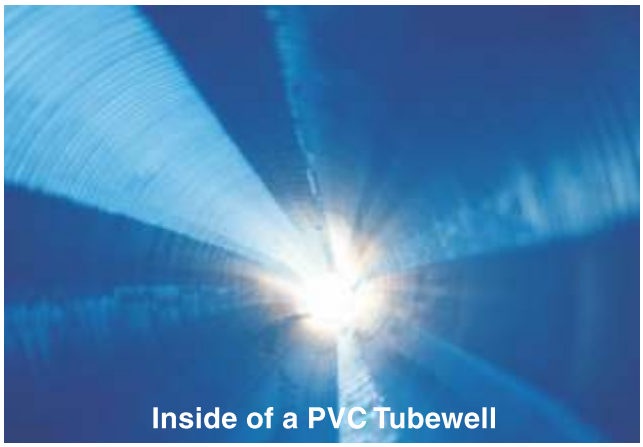


Split Clamp



Transition Fittings

Advantages of Jain uPVC Well Casing & Ribbed Screens over Metal Casings & Screens pipe.

METAL CASINGS AND SCREENS	JAIN uPVC WELL CASINGS AND RIBBED SCREENS
 Inside of Steel Tubewell	 Inside of a PVC Tubewell
• Due to local action and corrosive soil nature the life of tube wells is as low as two years.	• JAIN WELL CASINGS AND RIBBED SCREENS are manufactured out of quality PVC compound. PVC being inert material, JAIN WELL CASINGS AND RIBBED SCREENS are totally unaffected by corrosion.
• Slot opening get enlarged and silting starts due to erosion in the screens.	• Slot openings are not subjected to erosion hence they do not offer any resistance to flow.
• More than 50% of slot opening is obstructed by Filtering Media (Gravel Pack) hence low permeability.	• Due to the Ribs on the screen the FILTERING MEDIA (Gravel Pack) is kept 2mm away from the slot opening and this increases the permeability of JAIN RIBBED SCREENS.
• Screen slot widths can not be made to suit aquifer sieve analysis for proper design of the well which cannot be avoided.	• JAIN RIBBED SCREENS are manufactured with slot widths ranging from 0.2mm to 3mm to suit the aquifer sieve analysis which helps engineers to design the well to give better life and yield.
• Metal casing and screens are heavy, thus making installation cumbersome and tedious.	• The Specific gravity of PVC being 1.4, the JAIN WELL CASINGS AND RIBBED SCREENS weight only 1/5th of steel Casings and Screens. This makes it easier to handle and install.
• Metal casings require special equipments like welding sets and generator sets for assembly and erection.	• JAIN WELL CASINGS AND RIBBED SCREENS are manufactured with socket and spigot ends with suitable locking, which require no special equipments to assemble and install.
• Due to its weight, vertically can not be maintained.	• JAIN WELL CASINGS AND RIBBED SCREENS are supplied with centering guides to maintain verticality of the well.
• Metal Casing and Screen are costly.	• Total Installation with JAIN WELL CASINGS AND RIBBED SCREENS will be substantially cost effective when compared with conventional mild steel casings and screens.

THE COMPANY

Our Company, Jain Irrigation Systems Limited (JISL) with more than 10,000 associates worldwide and revenue of 59 billion rupees, is an Indian multinational company with manufacturing plants in 28 locations across the globe. It is engaged in manufacturing of Micro Irrigation Systems, PVC Pipes, HDPE Pipes, Plastic Sheets, Agro Processed Products, Renewable Energy solutions, Tissue Culture Plants, Financial Services and other agricultural inputs since last 34 years. It has pioneered silent revolution with modern irrigation systems and innovative technologies in order to save precious water and has helped to get significant increase in crop yields, especially for millions of the small farmers. It has also ushered in new concept of large scale Integrated Irrigation Solutions (IIS). All the products and services of Jain Irrigation help create a sustainable future while fulfilling its vision 'Leave this world better than you found it'.

JAIN
Jain Irrigation Systems Ltd.
Small Ideas. Big Revolutions.®

Germany Certification | Australia Certification | USA/ UK Certification

Jain Plastic Park, P.O. Box 72, Jalgaon-425001. India. Tel: 0257-2258011; E-mail: jisl@jains.com;
Website: www.jains.com; facebook: fb.com/JainIrrigationSyastems

Offices: Ahmedabad: 079-26421704; Anantapur: 08554-274226; Assam: 09435199998; Aurangabad: 0240-2345136; Bangalore: 080-25361257; Belgaum: 0831-2450022; Bhuvaneshwar: 09439363616; Bijapur: 08352-223011; Chittoor: 08572-226562; Chandigarh: 0172-2600901; Chennai: 044-28140507; Cochin: 0484-2307642; Coimbatore: 0422-2457318; Dehradun: 0135-2669865; Indore: 0731-4265112; Jaipur: 0141-2203515; Hyderabad: 040- 27611706; Kolkata: 09433047499; Lucknow: 0522-4021067; Madurai: 09443145112; Mumbai: 022-22129090; Nagpur: 07104-645025; New Delhi: 011-26691569; Pune: 020-26057777; Rachi: 0651-2532240; Raipur: 0771-2582091; Srinagar: 09797927458; Shiggaon: 08378-256198; Sirsa: 09416400207; Thane: 022-25443992; Trichy: 0431-4060601; Tirunelveli: 09443315945; Vadodara: 0265-2356727; Vijaywada: 0866-2081558.

Jain Pipes™ | Jain® PE Pipes | Jain™ Column Pipe | B-SURE™ GAS PIPE | B-SURE™ CORRUGATED PIPE | B-SURE™ SEWERAGE PIPE

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